IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Bartenbach et al.	Docket No.:	54395
Application No.:	10/806,232	Examiner:	BOYER, RANDY
Filed:	3/23/2004	Art Unit:	1764
Customer No.:	26474	Confirmation No.:	9664

For: Process for the scale-up of a reactor for carrying out a high-temperature reaction, reactor and use

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Sir:

This is an appeal from the final rejection mailed December 28, 2007.

The fee of $510.00 set forth in 37 C.F.R. § 41.20(b)(2) is paid by credit card. Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees, to Deposit Account 14.1437. Please credit any excess fees to such account.

REAL PARTY IN INTEREST:

The real party in interest is BASF SE, of Ludwigshafen, Germany.

RELATED APPEALS AND INTERFERENCES:

To the best of the undersigned's knowledge, there are no related interferences or judicial proceedings.

STATUS OF CLAIMS:

- Claims 1 – 18 and 20 – 24 are pending in the application.
- Claims 1 – 18 and 20 – 24 are rejected.
- Claims 1 – 18 and 20 – 24 are being appealed.
- No claims have been withdrawn from consideration.
- Claim 19 is canceled.

STATUS OF AMENDMENT:

An amendment to the claims was filed in reply to the final rejection of December 28, 2007. As noted in the Advisory action of April 02, 2008, the claim amendments were entered.

SUMMARY OF CLAIMED SUBJECT MATTER:

The invention of independent claim 1 relates to a process for the scale-up of a reactor.[1] The process for the scale-up of a reactor according to claim 1 is characterized in that for a throughput enlargement the internal diameter of the reactor is enlarged.[2] The reactor to be scaled-up according to the claimed process must have several specific

[1] Specification: page 1, line 11.
[2] Specification: page 2, lines 35 – 36.

features. The reactor must supply a reaction mixture via channels of a burner block to a reaction chamber.[3] A high temperature reaction having a short residence time must take place in the reaction chamber.[4] After the reaction takes place in the reaction chamber, the reaction mixture must be rapidly cooled in a quench area.[5] Crucially, the transition from the reaction chamber to the quench area must be designed in the form of an annular gap which is restricted to a width in the range from 2 to 200 mm.[6]

The invention according to independent claim 3 is directed to a reactor having a supply of a reaction mixture via channels of a burner block to a reaction chamber.[7] A high temperature reaction having a short residence time takes place in the reaction chamber.[8] Subsequently, the reaction mixture is rapidly cooled in a quench area.[9] The reactor is characterized in that the transition of the reaction chamber to the quench area is designed in the form of an annular gap.[10]

All other claims are dependent on claims 1 and 3. Summary of the subject matter of the dependent claims is omitted as unnecessary.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

Whether the Office action erred in rejecting:

I. claims 1 – 13 and 18 – 22 under 35 U.S.C. §102(b) over US 4,765,964 to Gravley (hereinafter, "Gravley");
II. claim 23 under 35 U.S.C §103(a) over Gravley or over Gravley in view of US 5,188,806 to Kuehner (hereinafter, "Kuehner"); and
III. claims 14 – 18 and 24 under 35 U.S.C §103(a) over Gravley in view of US 3,640,739 to Bakker (hereinafter, "Bakker").

[3] Specification: page 2, lines 31 – 33.
[4] Specification: page 2, lines 33 – 34.
[5] Specification: page 2, lines 34 – 35.
[6] Specification: page 2, line 36 – page 3, line 2; and specification: page 3, lines 14 – 16.
[7] Specification: page 3, lines 18 – 19.
[8] Specification: page 3, lines 19 – 20.
[9] Specification: page 3, lines 20 – 21.
[10] Specification: page 3, lines 22 – 23.

Note: The rejection of claims 3, 13 – 19 and 24 on the grounds of nonstatutory obviousness-type double patenting over claims 1 – 7 of US 6,869,279 has been withdrawn as stated in the Examiner's Interview Summary of June 04, 2008.

ARGUMENTS:

I. Applicants respectfully submit that the rejection of claims 1 – 13 and 18 – 22 under 35 U.S.C. §102(b) over Gravley is in error.

According to both independent claims 1 and 3, the transition from the reaction chamber to the quench area must be designed in the form of an annular gap. This characteristic is extremely important, because designing the transition of the reactor chamber to the quench area in the from of an annular gap allows for heat dissipation of the reaction mixture to occur "very effectively and homogenously by direct spraying in of water from one or from both sides of the gap with small jet reaches and very fine sprays."[11] Moreover, the claimed "annular gap" geometry solves the problems involved with reactor enlargement described in the specification on page 2, at lines 12 – 24.

The rejection under 35 U.S.C. §102(b) over Gravley is predicated on the allegation that no special definition has been provided for the term, "channel," or for the term, "gap." To the contrary, Applicants respectfully point out that "[t]he specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication."[12] The term "gap," is expressly defined by illustration in the figures. The term "gap," is also defined by implication in the present specification, which draws a distinction between a mere cylindrical geometry and a gap-like geometry, stating:

> Preferably, the transition from the reaction chamber to the quench area is restricted to a gap having a width in the range from 50 to 150 mm. Using the solution according to the invention presented here, the disadvantages of the

[11] Specification: page 3, lines 10 – 12.

[12] *Vitronics Corp. v. Conceptronic, Inc.* 90 F.3d 1576, 1582, C.A.Fed. (N.H.), 1996, citing *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979, 34 USPQ2d 1321, 1330 (Fed.Cir.1995) (in banc) (emphasis added).

> enlargement of the cylindrical cross section with respect to the realizable quench action are avoided by changing from the cylindrical geometry to a gap-like geometry. The gap is designed here such that heat dissipation is possible very effectively and homogeneously by direct spraying in of water from one or from both sides of the gap with small jet reaches and very fine sprays. Preferably, this gap is designed as an annular gap, thus preceding and afterconnected plant parts, which as a rule have a cylindrical cross section, can be integrated more easily.[13]

To make the definition of "gap" even clearer, an annular gap is illustrated in Figures 2 and 4 of the Specification.

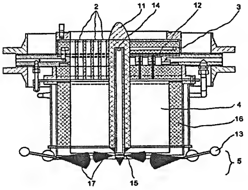


Figure 2.

Portion of Figure 4.

Figure 2. illustrates a section of a reactor, consisting of a burner block **3**, a reaction chamber **4** and a quench area **5**. Please notice the internal quench nozzles **15**, which are supplied via line **14**, and the spray jets **17**, which are directed into the annular gap <u>from both sides</u>. In other words, "[t]he gap is designed ... such that heat dissipation is possible very effectively and homogeneously by direct spraying in of water from one or from both sides of the gap with small jet reaches and very fine sprays."[14] Similarly, Figure 4. shows a quench medium sprayed clockwise in a tangential direction into the quench area designed as an annular gap, having a width of 550 mm, using annularly arranged quench nozzles.

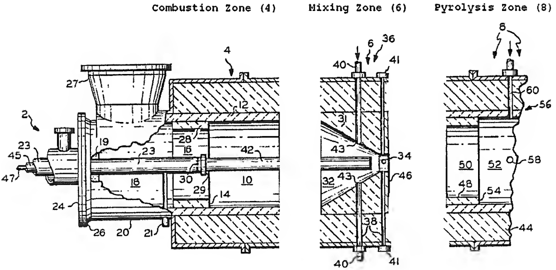
Again, the specification explains, "[t]he gap-like, preferably annular gap-like geometry of the transition from the reaction chamber to the quench chamber makes

[13] Specification, page 3, lines 4 – 16.
[14] Specification, page 3, lines 10 – 12.

possible jetting in of the quench medium, for example water or oil, either from one side of the gap or from both sides of the gap."[15] In a merely cylindrical geometry, such jetting in of the quench medium is impossible, because only one "side" exists. Moreover, regardless of whether quench medium is introduced from one side of the gap or from both sides of the gap, the gap-like geometry is critical in order to achieve the object of the present invention. The gap-like geometry allows for scale enlargement without yield losses, because "the disadvantages of the enlargement of the cylindrical cross section with respect to the realizable quench action are avoided by changing from the cylindrical geometry to a gap-like geometry."[16]

Applicants respectfully submit that the terms "gap," and "annular gap," as defined, illustrated, and explicitly contrasted to a cylindrical geometry, require more than a mere cylindrical geometry.

Gravley describes a reactor for the production of carbon black. The reactor comprises three zones: a combustion zone, a mixing zone, and a pyrolysis zone. The combustion zone is described in column 3, lines 7 – 65. The mixing zone is described in column 3, line 66 – column 5, line 43. The pyrolysis zone is described in column 5, line 44 – column 6, line 56. These three zones are illustrated in the following diagram.



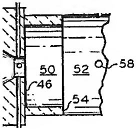
Applicants respectfully submit that the transition from the combustion zone (4) to the mixing zone (6) cannot properly be characterized as a transition from a reaction

[15] Specification, page 3, lines 29 – 32 (emphasis added).
[16] Specification, page 3, lines 7 – 10.

chamber to a quench area. Similarly, the transition from the mixing zone (6) to the pyrolysis zone (8) cannot properly be characterized as a transition from a reaction chamber to a quench area. The only conceivable transition from a reaction chamber to a quench area, described in Gravley, is within the pyrolysis zone. Gravley explains,

> [t]he pyrolysis zone **8** is further provided with a means **56** for supplying cooling fluid to the reaction flow passage. Generally, the means **56** comprises ports **58** opening into the pyrolysis zone **8**. Preferably, at least one of the ports **58** carries a tube and spray nozzle assembly **60** for introducing a quench fluid into the zone **8** to stop the pyrolysis reaction.[17]

Applicants respectfully submit that the transition from the first cylindrical zone **50** to the second cylindrical zone **52** is not in the form of an annular gap. Gravley explains, "[p]referably, an annular shoulder **54** separates the zones **50** and **52**, because this design provides a good flow pattern."[18] This portion of the pyrolysis zone of the Gravley reactor is illustrated in the following diagram.



It seems clear that Gravley does not disclose a transition from a reactor chamber to a quench area designed in the form of an annular gap, but instead discloses a mere cylindrical geometry. Yet, the Advisory action maintained the present rejection on the basis that, "'generally annularly shaped end **<u>wall</u>** 46 which extends from the downstream end of the throat 34 to the upstream end of pyrolysis zone sidewall 48 [and upstream of

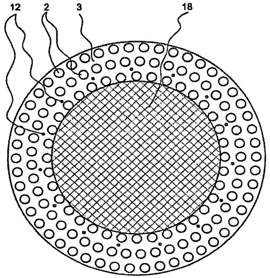
[17] Column 6, lines 37 – 43 of Gravley.
[18] Column 6, lines 34 – 36 of Gravley.

quench means 56]'"[19] clearly meets the presently claimed annular **gap**. First, end wall 46 is not a transition from a reactor chamber to a quench area. At best, end wall 46 is part of a transition from mixing zone 6 to pyrolysis zone 8. Secondly, and more importantly, equating an annularly shaped end **wall** with an annular **gap** constitutes clear error.

Gravley does not describe a transition in the form of an annular gap from a reaction chamber to a quench area. Instead of an annular gap, the reference describes a mere cylindrical geometry. Again, applicants respectfully submit that the terms "gap," and "annular gap," are defined, illustrated, and explicitly contrasted to such a cylindrical geometry in the present specification.

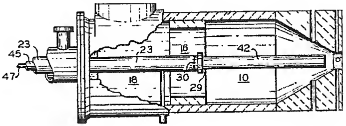
Anticipation can only be established by a single prior art reference which discloses each and every element of the claimed invention.[20] "The identical invention must be shown in as complete detail as is contained in the patent claim."[21] Since Gravley does not disclose a transition in the form of an annular gap from a reaction chamber to a quench area, Gravley does not anticipate independent claims 1 and 3. All other claims depend either from claim 1 or from claim 3, and include this feature.

Additionally, the reactor scaled-up by the process of claim 1, and the reactor of claim 3 must provide a supply of a reaction mixture via channels of a burner block to a reaction chamber, not merely through a single channel. Figure 3, reproduced to the right, shows a top view of a burner block according to the present invention. The channels **2** of the burner block **3** supply a reaction mixture to the reaction chamber.



[19] Page 2, Section #1 of the Advisroy action mailed April 02, 2008, (quoting Gravley, column 5, lines 63 – 66; and drawing), (emphasis added).
[20] *See, RCA Corp. v. Applied Digital Data Systems, Inc.,* 730 F.2d 1440, 1444 (Fed. Cir. 1984).
[21] *Richardson v. Suzuki Motor Co.,* 868 F.2d 1226, 1236 (Fed. Cir. 1989).

On the other hand, according to Gravley, "a tubular member **23** extends through the chamber **18** and empties into the passage **16**."[22] "Oxidant fluid and combustible fluid are introduced into a chamber **10** via the passage **16**."[23]



"A bluff body, preferably a generally annular flange **29** is attached to the tubular member **23** slightly downstream of the ports **30** to aid in maintaining stable combustion."[24] Optionally, an axial feedstock injector assembly **42** can be installed. This axial feed stock injector assembly "preferably comprises a feedstock tube **47** coaxially disposed within a waterjacket tube **45** ..."[25] The Gravley reactor does not provide a supply of a reaction mixture <u>via channels of a burner block</u> to a reaction chamber. Thus, Gravley does not anticipate independent claims 1 and 3. All other claims depend either from claim 1 or from claim 3, and include this feature.

For at least these reasons, applicants respectfully submit that the present invention is not anticipated by Gravley. Additionally, Gravley does not provide any hint that the specific reactor geometry required by the present invention would be specially suited for scale-up without losses in yield. No apparent reason existed to modify Gravley so that the reactor provides a supply of a reaction mixture via channels of a burner block to a reaction chamber. No apparent reason existed to modify Gravley so that the transition from the reaction chamber to the quench area is designed in the form of an annular gap, let alone an annular gap which is restricted to a width in the range from 2 to 200 mm. Thus, the present invention is also non-obvious over Gravley.

---

[22] Column 3, lines 22 – 24 of US 4,765,964.
[23] Column 3, lines 15 – 16 of US 4,765,964.
[24] Column 3, lines 52 – 55 of Gravley.
[25] Column 5, lines 34 – 36 of Gravley.

II. <u>Applicants respectfully submit that the rejection of claim 23 under 35 U.S.C §103(a) over Gravley or over Gravley in view of Kuehner is in error.</u>

Kuehner does not (and is not cited to) provide an apparent reason to modify Gravley so that the reactor provides a supply of a reaction mixture via channels of a burner block to a reaction chamber. Kuehner does not (and is not cited to) provide an apparent reason to modify Gravley so that the transition from the reaction chamber to the quench area is designed in the form of a gap, let alone an annular gap. Thus, the present invention is non-obvious over Gravley in view of Kuehner.

III. <u>Applicants respectfully submit that the rejection of claims 14 – 18 and 24 under 35 U.S.C §103(a) over Gravley in view of Bakker is in error.</u>

Bakker does not (and is not cited to) provide an apparent reason to modify Gravley so that the reactor provides a supply of a reaction mixture via channels of a burner block to a reaction chamber. Bakker does not (and is not cited to) provide an apparent reason to modify Gravley so that the transition from the reaction chamber to the quench area is designed in the form of a gap, let alone an annular gap. Thus, the present invention is non-obvious over Gravley in view of Bakker.

NOVAK DRUCE & QUIGG, LLP
1300 Eye St. N.W.
Suite 1000 West
Washington, D.C. 20005

Phone: (202) 659-0100
Fax: (202) 659-0105

Respectfully submitted,
NOVAK DRUCE & QUIGG, LLP

Michael P. Byrne

Michael P. Byrne
Registration No.: 54,015

CLAIMS APPENDIX:

1. A process for the scale-up of a reactor having a supply of a reaction mixture via channels of a burner block to a reaction chamber, a high temperature reaction having a short residence time taking place in the reaction chamber and the reaction mixture subsequently being rapidly cooled in a quench area, characterized in that for a throughput enlargement the internal diameter of the reactor is enlarged, the transition from the reaction chamber to the quench area being designed in the form of an annular gap which is restricted to a width in the range from 2 to 200 mm.

2. A process as claimed in claim 1, characterized in that the transition of the reaction chamber to the quench area is restricted to a gap having a width in the range from 50 to 150 mm.

3. A reactor having a supply of a reaction mixture via channels of a burner block to a reaction chamber, a high temperature reaction having a short residence time taking place in the reaction chamber and the reaction mixture subsequently being rapidly cooled in a quench area, characterized in that the transition of the reaction chamber to the quench area is designed in the form of an annular gap.

4. A reactor as claimed in claim 3, characterized in that the annular gap is restricted to a width in the range from 2 to 200 mm.

5. A reactor as claimed in claim 3, characterized in that the reaction chamber is designed in the form of an

annular gap.

6. A reactor as claimed in claim 3, characterized in that the channels of the burner block are aligned in the longitudinal axis of the reaction chamber.

7. A reactor as claimed in claim 3, characterized in that some of the channels for the supply of the reaction mixture and/or channels for the supply of additional oxygen or of reaction auxiliaries are aligned at any desired angle to the longitudinal axis of the reaction chamber and otherwise the channels of the burner block are aligned in the longitudinal axis of the reaction chamber.

8. A reactor as claimed in claim 3, characterized in that the quench area is constructed aligning in the direction of the longitudinal axis of the reaction chamber.

9. A reactor as claimed in claim 3, characterized in that the rapid cooling of the reaction mixture in the quench area is brought about by direct or indirect quenching.

10. A reactor as claimed in claim 8, characterized in that the direct quenching of the reaction mixture in the quench area is brought about by single- or multistage mixing of a cooling medium into the reaction mixture.

11. A reactor as claimed in claim 9, characterized in that the direct quenching of the reaction medium in the quench area designed like an annular gap is brought about by direct mixing of cooling medium into the quench area designed like an annular gap from outside and/or from inside.

12. A reactor as claimed in claim 3, characterized in that in the quench area direct quenching is brought about by introducing a cooling medium via quench nozzles which are arranged radially or tangentially to the main flow direction of the reaction mixture in the reactor, where in the case of a multistage introduction of cooling medium a countercurrent positioning of the quench nozzles is preferred.

13. A reactor as claimed in claim 3, characterized in that all surfaces restricting the reaction chamber are formed of a fire-resistant ceramic which is stable at reaction temperature having an alumina content of at least 80% by weight.

14. A reactor as claimed in claim 13, characterized in that the alumina content of the fire-resistant ceramic is at least 95% by weight.

15. A reactor as claimed in claim 13, characterized in that the alumina content of the fire-resistant ceramic is at least 96% by weight.

16. A reactor as claimed in claim 13, characterized in that the fire-resistant ceramic is introduced into the reaction chamber in the form of stones or blocks or as a cast or tamped mass and subsequently compressed, dried and calcined.

17. A reactor as claimed in claim 16, characterized in that the cast or tamped mass is calcined by the high temperature reaction.

18. A reactor as claimed in claim 13, characterized in that the fire-resistant ceramic has a thickness in the range from 7 to 30 cm.

19. (canceled)

20. A reactor as claimed in claim 4, wherein the annular gap is restricted to a width in the range from 50 to 150 mm.

21. A reactor as claimed in claim 8, wherein a quench area is constructed as a gap.

22. (previously presented) A reactor as claimed in claim 21, wherein the gap has an annular shape.

23. A reactor as claimed in claim 10, wherein the direct quenching of the reaction mixture in the quench area is brought about by single- or multistage mixing of an cooling medium into the reaction mixture via one or more annular distributors.

24. A reactor as claimed in claim 18, wherein in the fire-resistant ceramic has a thickness in the range from 8 to 10 cm.

EVIDENCE APPENDIX:

None.

RELATED PROCEEDINGS AAPPENDIX:

None.